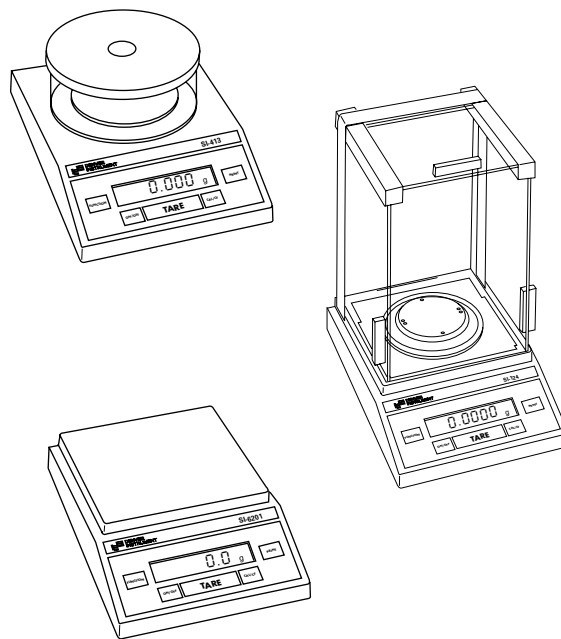




Summit Series

Operation Manual



You have purchased a quality precision weighing instrument that requires handling with care.

*Read entire contents of this **Operation Manual** prior to operating your new Denver Instrument balance.*

Disclaimer

Calibrate your balance using a reference weight of the appropriate tolerance (class). An instrument can be no more accurate than the standard to which it has been compared. For assistance in the selection of reference weights, please contact the factory.



Caution!

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.



Warning

Never lift balance by the weighing pan as this may cause damage to internal mechanisms.

Always lift and transport the balance by its base, including removal from packing materials!

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Specifications

Analytical Models	Weigh Range	Readability	Linearity	Pan Size
SI-124	120g	0.1mg	±0.2mg	3.1" dia. (79 mm)
SI-224	220g	0.1mg	±0.2mg	3.1" dia. (79 mm)
SI-215D	60/210g	0.01/0.1mg	0.03/0.2mg	3.1" dia. (79 mm)
Toploading Models				
SI-413	410g	0.001g	±0.001g	4.5" dia. (114mm)
SI-2202	2200g	0.01g	±0.01g	7.1x7.1" (180x180mm)
SI-4102	4100g	0.01g	±0.02g	7.1x7.1" (180x180mm)
SI-6201	6200g	0.1g	±0.1g	7.1x7.1" (180x180mm)

Common Specifications:

Dimensions (LxWxH) Analytical:	11.8 x 8.1 x 12.5" (290x200x300mm)
Dimensions (LxWxH) Toploading:	11.8 x 7.8 x 3.5" (30 x 20 x 9cm)
Net Weight Analytical:	13.2 lbs. (6.0 kg)
Net Weight Toploading:	10.0 lbs. (4.5 kg)
Power Requirements:	15 VDC@100 mA with AC adapter, center pin (-)
Temperature	15° - 40 °C (59° - 104° F)
Humidity:	80% for temperature to 31°C, decreasing linearly to 50% relative humidity at 40°C
Altitude:	3000m

Main supply voltage fluctuations not to exceed ±10% of nominal supply voltage. Equipment is suitable for continuous operation with AC adapter. Pollution degree: 2; Installation category: II; Sound Pressure Level emitted by equipment does not exceed ambient noise.



Caution:

Use AC adapter supplied with unit only!
Consult Denver Instrument for replacement.

Getting Started

Storage and Shipping Conditions

Allowable storage temperature:
+5°C...+40°C (+41°F...+104°F)

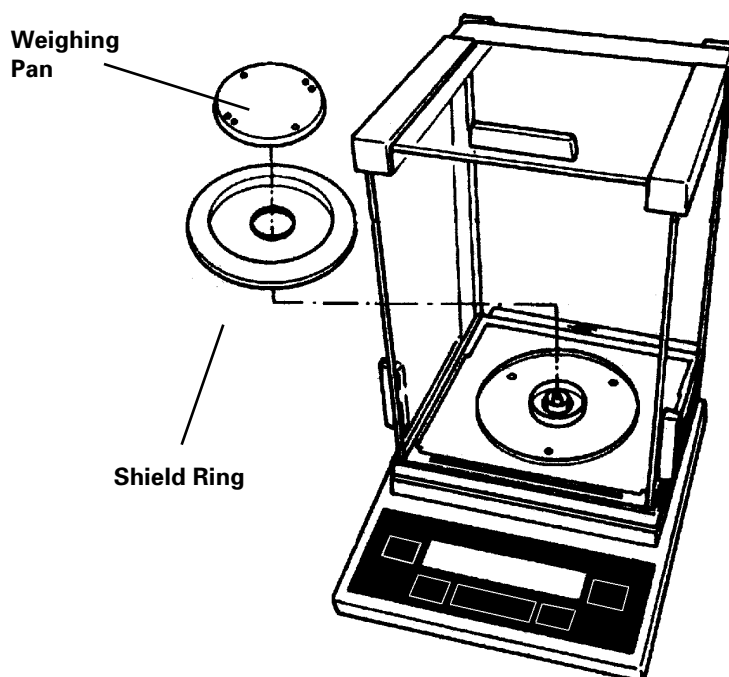
Save the box and all parts of the packaging for any future shipment of your balance as only the complete original standard packaging ensures safe transport. Before packing your balance, unplug all connected cables to prevent damage. Do not expose the balance unnecessarily to extreme temperatures, moisture, shocks, blows or vibration.

Remove the plastic wrapping, adhesive tape and styrofoam from the balance.

Preparing the Weighing Chamber for Balances with an Analytical Draft Shield Chamber

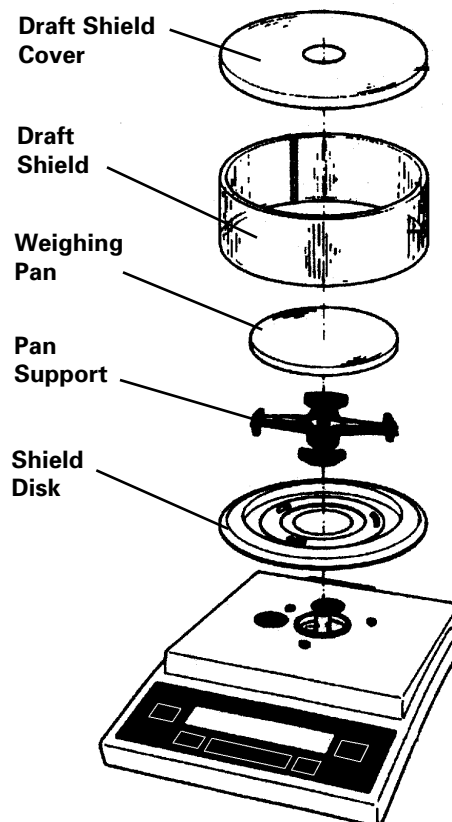
Place the components listed below inside the chamber in the order given:

- Shield ring
- Weighing pan



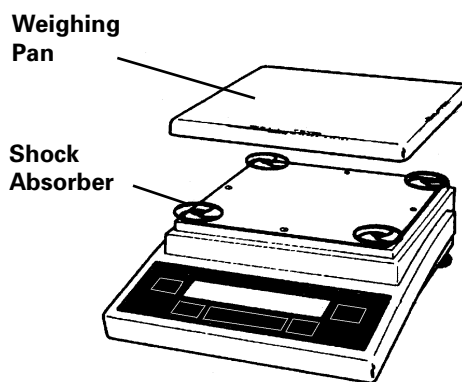
Preparing Balances with a Round Glass Draft Shield

- Place the shield disk on the balance. Turn the disk counterclockwise until it stops and is secured.
- Place the components listed below on the balance in the order given:
 - Pan support
 - Weighing pan
 - Glass draft shield cylinder
 - Draft shield cover



Preparing Balances with a Square Weighing Pan

- Place the components listed below on the balance in the order given:
 - Weighing pan



Connecting the Balance to AC Power

The balance is powered by an AC adapter. Make sure that the voltage rating printed on this unit is identical to your local line voltage. If the voltage specified on the label or the plug design of the AC adapter does not match the rating or standard you use, please contact your dealer.



Use only original adapters. To operate the balance using an external rechargeable battery pack, see "Accessories."

Safety Precautions

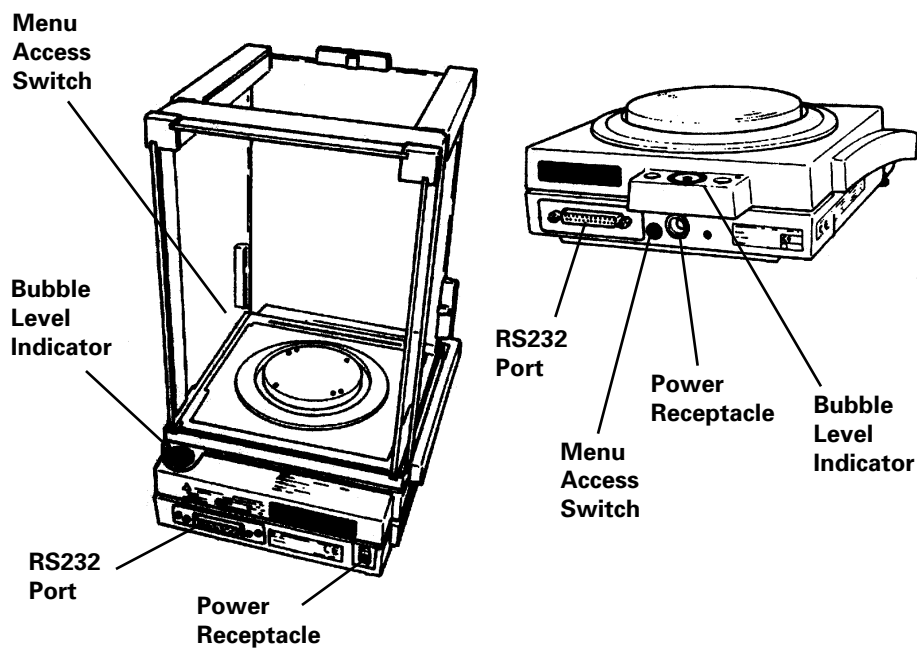
The AC adapter rated to Class 2 can be plugged into any wall outlet without requiring any additional safety precautions. The ground terminal is connected to the balance housing, which can be additionally grounded for operation. The data interface is also electrically connected to the balance housing (ground).

Connecting Electronic Peripheral Devices

Make absolutely sure to unplug the balance from AC power before you connect or disconnect a peripheral device (printer or PC) to or from the interface port.

Leveling the Balance Using the Level Indicator

At the place of installation, level the balance using the leveling feet so that the air bubble is centered within the circle of the level indicator.



Operation

The display shows the following special codes for your information:

O displayed in the upper right corner stands for OFF. The balance was disconnected from AC power and requires warm-up (balance reconnected to AC power or power outage longer than 3 seconds).

O displayed in the lower left corner means standby. The display has been turned off by the ON/OFF key. The balance is now in the ready-to-operate mode and does not require warm-up.

◇ means busy. Once you have turned on the balance, the ◇ symbol will briefly be displayed. During operation, this symbol indicates that the balance processor is still busy processing a function and will not accept another command to perform any other functions at this time.

Warm-up Time

To deliver exact results, the balance must warm up for at least 1 1/2 hours (6 hours for SI-215D) after connection to AC power or after a power outage. Only after this time will the balance have reached the required operating temperature.

Power-On Mode

Depending on your requirements, you can change the power-on mode of your balance.

The factory setting is: Power off -> on <-> standby (**Menu code 8 5 1***)

In this default setting, when you press the ON/OFF key to turn off the display, the balance will remain in the standby mode. This means that it will be ready to operate without requiring any warm-up when you turn the display back on.

On <-> standby (**Menu Code 8 5 3**)

In the setting "Toggle between on and standby," the balance will automatically turn on again after it has been temporarily disconnected from AC power or a power failure has occurred.

Automatic power-on (**Menu Code 8 5 4**)

In the setting "Automatic power-on," the balance will automatically turn on again after it has been temporarily disconnected from AC power, the ON/OFF key has been pressed, or after a power failure has occurred. In this setting, you cannot use the ON/OFF key to turn off the balance. If your balance is connected to a central power supply that is switched off overnight, the balance will turn on automatically the next day as soon as the power supply is switched on again.

Self-Test

After the balance has been turned on, an automatic self-test of the balance's electronic circuitry is performed. At the end of the self-test, a zero readout is displayed. This means that the balance is ready to operate.

Taring

A weight can be determined accurately only from a defined zero point. Press TARE to zero the weight display. You can tare within the entire weighing range of the balance.

Weighing

Simple Weighing (Weight Determination)

Place your sample on the weighing pan to determine the weight. Read off the weight indicated on the display only after the weight unit "g" or a different unit selected appears as the stability symbol.

Toggle between weighing units

Press FUNCTION to toggle back and forth from two chosen units. the second unit is identified by the display symbol "R1".

- block function key (**Menu Code 2 1 1***)
- mass unit conversion by toggling (**Menu Code 2 1 2**)

Select weighing units

Enter the codes below for first or second level units

Name	Symbol	Conversion factor 1 g =	1st level Code	2nd level R1 Code
Grams	g	1.0	1 7 1	3 1 1
Grams	g	1.0	1 7 2*	3 1 2
Kilograms	kg	0.001	1 7 3	3 1 3
Carats	ct	5.0	1 7 4	3 1 4
Pounds	lb	0.0022046226	1 7 5	3 1 5
Ounces	oz	0.035273962	1 7 6	3 1 6
Troy ounces	ozt	0.032150747	1 7 7	3 1 7
Hong Kong tael	tl (thl)	0.02671725	1 7 8	3 1 8
Singapore tael	tl (ths)	0.02646063	1 7 9	3 1 9
Taiwanese tael	tl (tht)	0.02666666	1 7 10	3 1 10
Grains	GN	15.43235835	1 7 11	3 1 11
Pennyweights	dwt	0.643014931	1 7 12	3 1 12
Milligrams	mg	1000.0	1 7 13	3 1 13
Parts per pound	o (/lb)	1.1287667712	1 7 14	3 1 14
Chinese tael	tl (thlc)	0.02645547175	1 7 15	3 1 15
Mommes	m (mom)	0.2667	1 7 16	3 1 16
Carats	k (K)	5.0	1 7 17	3 1 17
Tola	t (tol)	0.0857333381	1 7 18	3 1 18
Baht	b (bat)	0.06578947436	1 7 19	3 1 19
Mesghal	(MS)	0.217	1 7 20	3 1 20

Display Modes

You can select the display mode that best meets your individual accuracy requirements (last numeral). The display increments possible are as follows: 1, 2, 5, 10, 20, 50, etc.

Display mode	1st level Code	2nd level R1 Code
Highest possible accuracy	1 8 1*	3 2 1*
Rounding factor 2	1 8 3	3 2 3
Rounding factor 5	1 8 4	3 2 4
Rounding factor 10 (last numeral off)	1 8 5	3 2 5

Calibration/Adjustment

During calibration, the span of the balance is adjusted to the changes in ambient conditions. You must adjust or calibrate your new balance at the place of installation after each warm-up period and before the first measurement. You must also re-adjust or recalibrate your balance each time you set it up in a different area or when ambient conditions change (especially the temperature).



Note:

You can interrupt any adjustment or calibration function by pressing CAL/CF.



Note:

During calibration, the weighing pan must be unloaded.

Internal Calibration

(Select Menu code: 1 9 3*)

1. Empty weighing pan
2. Press TARE
3. When display reads 0 grams press the CAL key to activate the calibration function. The built-in calibration weight is internally applied by servomotor and removed at the end of adjustment or calibration.



Note:

If any interference affects the calibration procedure, you may obtain a brief display of the error code "Err 02." In this case, tare and press the CAL key again.

External Calibration

(Select Menu code: 1 9 1)

Use only calibration weights with nominal mass values and tolerances equal to or better than the accuracy class specified for your balance.

Permissible External Calibration Weights

<u>Model</u>	<u>Weight</u>	<u>Minimum Weight Class</u>
SI-124	100 grams	ASTM Class 1
SI-224	200 grams	ASTM Class 1
SI-215D	200 grams	ASTM Class 1
SI-413	200 grams	ASTM Class 2
SI-2202	1000 grams	ASTM Class 2
SI-4102	2000 grams	ASTM Class 2
SI-6201	5000 grams	ASTM Class 3

1. Empty weighing pan
2. Press TARE
3. Press CAL
4. Center the calibration weight on the weighing pan. The balance then calibrates automatically.
5. At the end of calibration, the calibration weight is displayed and the stability symbol "g" appears.

Block Calibration

(Select menu code: 1 9 7)

Blocks CAL KEY so calibration or adjustments cannot be made.



Note:

Only when menu access switch is in “locked” position (see page 13, “Menu Access Switch” for details).

Percent Weighing

Weighing in Percent (Menu Code 2 1 5)

Symbol displayed: %

This application program enables you to obtain weight readouts in percent which are in proportion to a reference weight. The reference weight readout is stored as a menu-defined percentage (factory setting: 100%).

1. Select Percent Code 2 1 5 (see back inside cover for instructions).
2. A “%” will be displayed on the bottom of the display.
3. Tare the balance and place the reference weight on the balance.
4. Press the FUNCTION key and the current reference percentage will appear on the screen.
5. The screen will then flash and show the percentage on the balance.
6. Add or subtract parts and the percentage weight will be displayed.

Toggling between the Readout in Percent (%) and Weight (g)

After placing the sample on the weighing pan, you can toggle between the readout in percent and the respective weight readout in grams by pressing the FUNCTION key after you have stored the reference value.

Resetting the Reference Weight

1. Place the new reference weight on the balance.
2. Hold down CF for more than 2 seconds until the reading is in grams.
3. Press FUNCTION and “rEF (current setting) %” appears on display.
4. The screen will then flash and show the percentage on the balance.
5. Add or subtract parts and the percentage weight will be displayed.

Changing the Reference Percentage

You can change the reference percentage in cycles. Choose from the following settings: 5, 10, 20, 50 and 100.

1. Hold down FUNCTION for more than 2 seconds until "rEF 100 %" appears on the display
2. Briefly press FUNCTION change the setting to the desired value
3. Hold down FUNCTION for more than 2 seconds to store this value permanently (in the non-volatile memory) after you turn off the power



Note:

This setting is not canceled by the reset code 9 – 1°!

When you exit the reference storage mode, "Err 22" may briefly be displayed. This means that the new reference value has been stored.

Storage Parameter for the Reference Weight/Value

The reference weight/value is stored:

- with full accuracy according to internal resolution
(Menu Code 3 5 1*)
- according to display accuracy (Menu Code 3 5 2)

Display Parameter for Readouts in Percent

The following display parameters can be set for readouts in percent:

The readout in percent is displayed:

- without a decimal place (Menu Code 3 6 1)
- with one decimal place (Menu Code 3 6 2*)
- with two decimal places (Menu Code 3 6 3*)
- with three decimal places (Menu Code 3 6 4)

If the weight stored is too light to be displayed, the number of decimal places is automatically decreased.

Counting

Counting Mode (Menu Code 2 1 4)

Symbol displayed: 

The counting program allows automatic conversion of weights into piece counts based on a reference sample weight. A weight readout is stored as a reference sample quantity (factory setting: 10 pcs = pieces). When you turn on the balance, the reference sample quantity will be displayed as "rEF 10 pcs" before you enter the piece count.

1. Select Count Menu Code 2 1 4 (see back inside cover for instructions).
2. A "" will be displayed on the bottom of the display.
3. Tare the balance and place the reference weight on the balance.
4. Press the function key and the current reference count will appear on the screen.
5. The screen will then flash and show the count on the balance.
6. Add or subtract parts and the count will be displayed.

Toggle between the Piece Count (pcs) and Weight (g)

After placing the sample on the weighing pan, you can toggle between the piece count and the respective weight readout by pressing the FUNCTION key.

Resetting the Reference Weight

1. Place the new reference weight on the balance.
2. Hold down CF for more than 2 seconds until the reading is in grams
3. Press FUNCTION and "rEF (current setting)pcs" appears on display.
4. The screen will then flash and show the count on the balance.
5. Add or subtract parts and the count will be displayed.

Changing the Reference Sample Quantity

You can change the reference sample quantity in cycles. Choose from the following settings: 5, 10, 20, 50 and 100.

1. Hold down FUNCTION for more than 2 seconds until change function: "rEF...pcs" appears on the display
2. Briefly press FUNCTION until the desired setting is displayed
3. Hold down FUNCTION for more than 2 seconds to store this quantity permanently (in the non-volatile memory) after you turn off the power.



Note: When you exit the reference storage mode, "Err 22" may briefly be displayed. This means that the new reference value has been stored.

This setting is not canceled by the reset code 9 – – 1°!

Storage Parameter for the Reference Sample Weight

The reference weight is stored:

- with full accuracy according to internal resolution
(Menu Code 3 5 1*)
- according to the display accuracy (Menu Code 3 5 2)

Animal Weighing/Averaging

Animal Weighing/Averaging (Menu Code 2 1 7)

Symbol displayed: 

Use this program to determine the weights of live animals or weights under unstable ambient conditions. In this program, the balance calculates the weight as the average of a selectable number of individual weighing operations. During averaging, the number of remaining individual subweighing operations is shown on the application display in a “count down” mode. Once all subweighing operations have been performed, the calculated mean value is indicated as a stable readout on the weight display.

Automatic Mode (Menu Code 3 8 2*)

1. Press FUNCTION to start the program for averaging the first weight.
2. The symbol “AUTO” will be displayed.
3. A count down begins for the number of readings used for averaging.
4. When the result is locked the “” symbol and “AUTO” flashes
5. The icon will stop flashing after you have unloaded the balance.
6. Add the next sample and the count down will begin automatically.



Note:

You can press CF to interrupt a weight measurement in progress at any time.

Manual Mode (Menu Code 3 8 1)

1. Press FUNCTION to start the program for averaging.
2. You can press CF to interrupt a weight measurement in progress at any time.
3. A count down begins for the number of readings used for averaging.
4. When the result is locked, the “” symbol flashes on the display.
5. The icon will stop flashing after you have unloaded the balance.
6. Add the next sample and press FUNCTION to start the next count down.



Note:

You can press CF to interrupt a weight measurement in progress at any time.

Delayed Start Mode

A rule of thumb to go by for selecting the right setting to weigh animals is: the more active an animal is, the greater the difference must be between two successive subweights measured. Depending on individual requirements, starting the averaging operation can be delayed either in the automatic or manual mode until the animal you are weighing has calmed down to a certain degree. In this case, the start criterion is defined by the difference between two successive subweights measured. If the animal moves, the start criterion is not met; therefore, averaging will not start. Once the animal has calmed down, the program checks whether two measured subweights are within the previously selected range. If so, the actual averaging operation will be started.

Delay start until:

- difference is slight (**Menu Code 3 7 1**)
- difference is average (**Menu Code 3 7 2***)
- difference is considerable (**Menu Code 3 7 3**)

During averaging, the number of subweighing operations left to perform is shown on the weight display (countdown mode).

Changing the Number of Subweighing Operations/ "Count Down"

You can change the number of subweighing operations used to average a weight. Change this number in cycles. You can choose from the following settings: 5, 10, 20, 50 and 100.

1. Hold down FUNCTION for more than 2 seconds until "rEF 10" appears on the display
2. Briefly press FUNCTION until the desired selection is displayed.
3. Hold down FUNCTION for more than 2 seconds to store this number permanently



Note:

This setting is not canceled by the reset code 9 – – 1°!

Tare Memory/Net Weighing

Tare Memory/Net Weighing (Menu Code 216)

Symbol displayed: NET

Use this program to determine the individual weight of several samples and record the net weight.

1. Select menu code 2 1 6
2. Press the FUNCTION key to store the tare weight
3. Add the next sample, press the FUNCTION key to store the weight and tare the balance
4. Repeat steps 2 - 3, as needed
5. When completed, press and hold CF key for at least 2 seconds

Output Parameter

- print individual components (N1) & tare weights
(Menu Code 7 3 1*)
- print net total tare weight (T1) (Menu Code 7 3 2)

Output Symbols

- T1 tare weight stored in memory
- N1 net weight when tare weight is stored
- N gross weight = tare + net weight

Balance Operating Parameters

In the operating menu of the balance, you can define how your balance will adapt to ambient conditions and also how it will work to meet your special requirements.

Adapting the Balance to Ambient Conditions

The balance can be adapted to the prevailing ambient conditions at the place of installation:

- very stable conditions (Menu Code 1 1 1)
- stable conditions (Menu Code 1 1 2)
- unstable conditions (Menu Code 1 1 3)
- very unstable conditions (Menu Code 1 1 4)

Standard Weighing Mode – Manual Filling Mode

You can optimally adapt your balance to meet either of these requirements.

In the manual filling mode, the display compensates for fluctuations of the load on the balance, giving you especially fast and stable readouts.

- standard weighing mode (Menu Code 1 2 1*)
- manual filling mode (Menu Code 1 2 2)

Stability Range

The stability symbol will remain displayed in the case of a weight variation +/-

- 0.25 digit (Menu Code 1 3 1)
- 0.5 digit (Menu Code 1 3 2)
- 1 digit (Menu Code 1 3 3)
- 2 digits (Menu Code 1 3 4)
- 4 digits (Menu Code 1 3 5)
- 8 digits (Menu Code 1 3 6)

Starting with the basic increments of a weight unit, the display accuracy can be reduced by as many as three levels so that you will obtain a faster readout with a reduced display accuracy. The display accuracy is reduced proportionally to the selected basic increment of a weight unit. To make this concept easier to understand, the three levels are designated as "rounding factors" in the tables summarizing the various menu code settings.

Tare Parameter

You can define when the balance will perform the taring operation:

- at any time (Menu Code 1 5 1)
- not until the readout is stable (Menu Code 1 5 2*)

Auto Zero Function

When this zero-tracking function is activated, any slight changes off the zero readout are automatically tared.

- auto Zero On (Menu Code 1 6 1*)
- auto Zero Off (Menu Code 1 6 2)

Menu Access Switch Function

The menu access switch allows you to prevent change of the menu codes. Looking at the rear of the balance, when the menu access switch is on the right (towards the power plug), the switch is "unlocked". This allows you to access all of the balances' features.

When the switch is "locked" (switched to the left or towards the RS232 port) the following codes apply:

Menu codes are accessible (8 1 1)

Menu codes are blocked (8 1 2*)



When the menu access switch is "locked" and Code 8 1 2 is set, the current menu code can be viewed (by following the procedure on the inside back cover) but no changes can be saved.

Other features, such as calibration, can also be blocked by using the menu access switch. See individual section for details.

Blocking the Keys

You can block all keys on the balance (except for ON/OFF).

- accessible **(Menu Code 8 3 1*)**
- blocked **(Menu Code 8 3 2)**

Below-Balance Weighing

A port for a below-balance weighing hanger is located on the bottom of the balance.

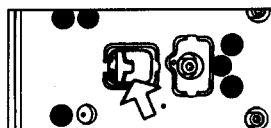
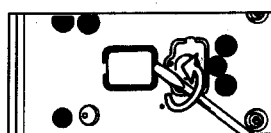
For Balances with an Analytical Draft Shield Chamber:

To hook a sample on the hanger, open the below-balance port by turning the cover plate.

For Precision Balances (Weighing Capacity of <10 kg):

To open the below-balance port, remove the cover plate from the bottom of the balance. Now you can attach a sample using a suspension wire, for example.

Common applications for below-balance weighing include density determination and immersing a sample in a special atmosphere (medium for reaction).



Note:

When you use the below-balance weighing hanger, you must install a shield for protection against drafts.

Fastening an Antitheft Locking Device (for toploading balances only)

To fasten an antitheft locking device, use the lug located on the rear panel of the balance.

RS-232 Interface

RS232 for Printouts or Data Transfer

You can attach a GLP printer (see accessories) or a computer into this interface port. In addition, you can choose to have data output from your balance to this on-line device either automatically or by pressing the PRINT key.

The balance operating menu lets you define the various parameters for data output.

Information on the data formats and for interfacing a computer or a different peripheral device are available on request.

Interface Port

Depending on the balance model, unfasten or remove the protective cap from the data interface port.

- Plug the connector into the interface port
- Secure the connector by tightening the screws



Note:

Make absolutely sure to unplug the balance from AC power before you connect or disconnect a peripheral device (printer or PC) to or from the interface port.

To print or output data, press the PRINT key.

Interface Description

This description has been written for users who wish to connect their balance, which has a built-in V24/V28-RS-232C(-S)*/423 interface port as a standard feature, to a computer or a different peripheral device.

By using an on-line computer, you can change, activate and monitor the functions of the balance. If you interface with the GLP Data Printer (see accessories), you do not need to change any settings.

Interfacing Devices with the Balance

Please note that the interface port is electrically connected to the protective grounding conductor (protective earth = PE) of the balance housing. The cabling supplied as accessory components is shielded and electrically connected on both ends to the cases of the connectors. This electrical connection may result in interference caused by ground loops or by transient currents if you have grounded the housing or connected the protective grounding conductor for AC power. If necessary, connect an equipotential bonding conductor to the balance.

Pin Assignment Chart

Female Interface Connector:

25-position D-submini, DB25S, with screw lock hardware for cable gland

Male Connector Used: (please use connectors with the same specifications) 25-pin D-submini, DB25S, with integrated shielded cable clamp assembly (Amp type 826 985-1C) and fastening screws (Amp type 164 868-1)

Warning When Using Pre-wired RS-232 Connecting Cables!

RS-232 cables purchased from other manufacturers often have incorrect pin assignments for use with Denver Instrument balances. Be sure to check the pin assignment against the chart below before connecting the cable, and disconnect any lines marked "Internally Connected" (e.g., pin 6). Failure to do so may damage or even completely ruin your balance and/or peripheral device.

Pin Assignment:

Pin 1: Signal Ground
Pin 2: Data Output (TxD)
Pin 3: Data Input (RxD)
Pin 4: Internal Ground (GND)
Pin 5: Clear to Send (CTS)
Pin 6: Internally Connected
Pin 7: Internal Ground (GND)
Pin 8: Internal Ground (GND)
Pin 9: Reset _ In*)
Pin 10: Not Connected
Pin 11: +12 V
Pin 12: Reset _ Out*) Connection for a switch
Pin 13: +5 V
Pin 14: Internal Ground (GND)
Pin 15: Universal Switch
Pin 16: Not Connected
Pin 17: Not Connected
Pin 18: Not Connected
Pin 19: Not Connected
Pin 20: Data Terminal Ready (DTR)
Pin 21: Internal Ground (GND)
Pin 22: Not Connected
Pin 23: Not Connected
Pin 24: Not Connected
Pin 25: +5 V
*) = hardware restart

Serial Interfacing

During data communication between the balance and an on-line device (computer), "telegram-style" information consisting of ASCII characters is transmitted by the interface. For error-free data communication, the interface parameters, including the baud rate, parity and handshake mode as well as the character format, must be the same for both units. You can change these parameters in the balance operating menu so that they match those of the on-line device. If you do not plug a peripheral device into the interface port on the balance, this will not generate an error code. In this case, data will be output but not received.

Data Bits	
7	not adjustable
Baud Rate	Code
150 baud	5 1 1
300 baud	5 1 2
600 baud	5 1 3
1,200 baud	5 1 4*
2,400 baud	5 1 5
4,800 baud	5 1 6
9,600 baud	5 1 7
19,200 baud	5 1 8
Parity	Code
Mark	5 2 1
Space	5 2 2
Odd	5 2 3*
Even	5 2 4
Number of Stop Bits	Code
1 stop bit	5 3 1*
2 stop bits	5 3 2

Handshake

The balance interface has a 23-byte transmit buffer and a 40-byte receive buffer.

You can access the balance operating menu to define various handshake parameters:

- software handshake (**Menu Code 5 4 1**)
- hardware handshake with 2 characters after CTS (**Menu Code 5 4 2***)
- hardware handshake with 1 character after CTS (**Menu Code 5 4 3**)

Print Commands

This parameter is coupled with the stability parameter

Print on request = data is output only when the PRINT key is pressed or a software command is received

Auto print = continuous, automatic data output

- print on request regardless of stability (**Menu Code 6 1 1**)
- print on request after stability, with storage of function (**Menu Code 6 1 2***)
- print on request at stability, without storage of function (**Menu Code 6 1 3**)
- auto print regardless of stability (**Menu Code 6 1 4**)
- auto print at stability (**Menu Code 6 1 5**)

Auto Print

You can stop and start automatic data output (auto print function) by pressing the PRINT key.

- start/stop auto print using the PRINT key (**Menu Code 6 2 1**)
- auto print not stoppable (**Menu Code 6 2 2***)

Data Output at Defined Intervals

The menu code for "2 display updates" must be set if you connect the remote display to the balance.

- 1 display update (**Menu Code 6 3 1***)
- 2 display updates (**Menu Code 6 3 2**)

Automatic Taring after Data Output

This convenient setting lets you check weigh a series of samples or products without having to unload the balance after each weighing operation.

- the sample remains on the pan after the weight readout has been printed or transferred to an on-line computer
- the balance is tared automatically after the weight readout has been printed or transferred to an on-line computer
- you simply load the next sample or part
 - data output without automatic taring (**Menu Code 6 4 1***)
 - data output with automatic taring (**Menu Code 6 4 2**)

Automatic Output of the Application Parameters

After completing an application started by pressing the FUNCTION key, you can have the application parameters and results printed out or transferred to an on-line computer.

- Off (**Menu Code 7 1 1***)
- On (**Menu Code 7 1 2**)

Data ID Codes

To help you identify weights, piece counts, percentages, etc., a code letter is printed or displayed in front of these values. For example, an "N" printed or displayed in front of a weight value identifies it as a net weight. If you set the code for "without data ID code," only net weights, results in percent and counting results will be output. You will find the data ID codes for a particular application program listed in the corresponding description.

Data Output Formats

Depending on the menu code setting:

7 2 1 = without data ID code

or 7 2 2 = with data ID code

data will be output with either 16 (code 7 2 1) or 22 characters (code 7 2 2).

For data output of 22 characters, a 6-character ID precedes the 16 characters reserved for the weight or other value.

Data Output Format with 16 Characters.

Display segments that are not activated ("+" or "-" sign, leading zeros other than zeros before the decimal point) are output as spaces.

The following data block format is output according to what is displayed on the balance:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+		*	*	*	*	*	*								
		10 ⁶	10 ⁵	10 ⁴	10 ³	10 ²	10 ¹	10 ⁰			*	*	*		
*	*	0	0	0	0	0	0	0		*				CR	LF
			.	.	.	.	.	.			U	U	U		
				10 ⁵	10 ⁴	10 ³	10 ²	10 ¹	10 ⁰						
-				0	0	0	0	0	0						
				*	*	*	*	*	*						

* = space; U = unit

When data are output without decimals, the decimal point is suppressed (except when a certain display mode is selected).

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+			*	*	*	*	*	*			*	*	*		
*	*	*	10 ⁶	10 ⁵	10 ⁴	10 ³	10 ²	10 ¹	10 ⁰	*		U	U	U	CR
-				0	0	0	0	0	0						LF

Data output example: +72.55 g

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+	*	*	*	*	7	2	.	5	5	*	g	*	*	CR	LF

Characters:

1st	Plus or minus sign or space
2nd	Space
3rd-10th	Weight with a decimal point, leading zeros = space
11th	Space
12th-14th	Unit symbol or space
15th	Carriage return (CR)
16th	Line feed (LF)

If the weighing system has not stabilized, no unit symbol will be output.

Unit symbols:

* * *	No stability parameter	G N *	Grains
o * *	Taiwanese tael (o)	d w t	Pennyweights
g * *	Grams	mg *	Milligrams
k g *	Kilograms	/ l b	Parts per pound
c t *	Carats	t l c	Chinese tael
l b *	Pounds	mo m	Mommes
o z *	Ounces	K * *	Austrian carats
o z t	Troy ounces	t o l	Tola
t l h	Hong Kong tael	b a t	Baht
t l s	Singapore tael	MS *	Mesghal
t l t	Taiwanese tael		

* = space; U = unit

Special codes are output only if the balance operating menu code 611, 614 or 615 is set (see the section entitled "Data Output Parameters").

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

The following status codes are output for "A B":

Special error-dependent codes

X = *, 0, 1 or 2 as a one-place error code

YZ = two-place error index code

* = space

*) = The displayed status code "C" will also be output when a print command is received and if the balance has a built-in calibration weight

Data Output with ID Code

When data with an ID code are output, the ID code consisting of 6 characters precedes the data with the 16-character format.

During data output, all characters are shifted to the right by 6 places.

1st						7th																22nd character
C	C	C	C	C	C	S	*	x	x	x	x	x	x	x	x	*	U	U	U	CR	LF	
	*	*	*	*	*	*		*	.	.	.	.	.	.	.		*	*	*			

S = Plus or minus sign

* = Space

x = Digit

U = Unit

. = Decimal point

C = Letter for an ID comment

CR = Carriage return

LF = Line feed

When special codes are output, the letters "Stat" for status code are assigned to the 1st through the 4th characters for the data string.

Status-dependent string:

1st						7th						13th	14th									22nd character
S	t	a	t	*	*	*	*	*	*	*	*	A	B	*	*	*	*	*	*	CR	LF	

A, B = status codes

Error-dependent string:

1st						7th				10 - 12th		14 - 16th										22nd character
S	t	a	t	*	*	*	*	*	*	E	R	R	*	X	Y	Z	*	*	*	*	CR	LF

ISO/GLP-compliant Printout or Record

Use of the balance as a test and measuring instrument in quality assurance systems in compliance with the requirements of ISO, GLP, GMP and EN (European Standards) in which proof of the balance's accurate performance is required. The balance can record all completed calibration or adjustment operations and print out data in compliance with the requirements of Good Laboratory Practice (GLP). The balance, interfaced with a data printer or a computer, can create a document that records the date, time, serial number and model number, making it possible to clearly trace data to the balance that generated it and the time at which it was generated.

Select the ISO/GLP-compliant printout or record mode by setting the respective code in the balance operating menu:

ISO/GLP-compliant printout/record mode

- Off (**Menu Code 8 10 1***)
- only for adjustment/calibration and linearization functions (**Menu Code 8 10 2**)
- always on (e.g., for adjustment/calibration and linearization functions, application programs, weight readouts) (**Menu Code 8 10 3**)

The following menu code setting must be selected in order to obtain an ISO/GLP- compliant printout/record:

- with data ID code (**Menu Code 7 2 2**)
- with application parameter (**Menu Code 7 1 2**)



Note:

ISO/GLP-compliant printouts/records will not be generated if the factory setting, menu code 7 2 1 or 711 is selected. In addition, do not select the "Auto print" data output parameter (Menu Code 6 1 4 or 6 1 5).

Data Input Formats

Commands can be input via the balance interface port to control the balance functions.

Control commands are distinguished according to those with upper-case letters, or special characters, and those with lower-case letters.

Control command can include up to 13 characters. each character must be transmitted with a start bit, a 7-bit ASCII-coded character, a parity bit and one or two stop bits.

Formats:

ESC f X CR LF

ESC K CR LF

Where:

ESC = Escape (ASCII 27)

K, f = Command characters

X = Number = Underline (ASCII 95)

CR = Carriage return (ASCII 13)

LF = Line feed (ASCII 10)

The characters CR and LF do not have to be transmitted in the data string.

Control Commands with Upper -Case Letters or Special Characters

ESC P CR LF (Print; activate/block auto print)

ESC S CR LF (Restart/self- test)

ESC T CR LF (Tare)

ESC P CR LF (Internal calibration adjustment)

The "P," "T" and "Z" commands do not affect the menu code settings of the balance to reinitialize (turns the scale off and back on again). The "S" command causes the processor to reinitialize (turns the scale off and back on again).

The balance will operate according to the commands available up until the processor is reinitialized. Once the balance has been turned on, the processor will always recognize the codes entered by the user in the balance operating menu.

ESC O CR LF (Block the keys)

ESC R CR LF (Release the keys)

ESC K CR LF (Very stable)

ESC L CR LF (Stable)

ESC M CR LF (Unstable)

ESC N CR LF (Very unstable)

Control Commands with Lower-Case Letters

All functions that can be selected by pressing the respective keys on the balance can also be activated by commands.

ESC f 0 _ CR LF (function key)

ESC f 1 _ CR LF (cal key)

ESC s 3 _ CR LF (clear function)

ESC x 0 _ CR LF (Perform calibration test)

ESC x 1 _ CR LF (Output scale model)

ESC x 2 _ CR LF (Output serial number)

Each control command with the lower-case letters "f," "s" and "x" must be terminated by an underline (ASCII = 95).

Troubleshooting

Problem	Causes	Solution
No segments appear on the weight display	No AC power is available. The AC adapter is not plugged in.	Check the AC power supply. Plug in the AC adapter.
No segments appear on the weight display after calibration or adjustment	The surface on which balance rests is not stable. The balance has not yet internally stabilized.	Make sure that ambient conditions are stable. Prevent vibrations affecting the surface on which the balance rests. Close the draft shield.
The weight display shows "H"	The load capacity exceeds the capacity of the balance.	Unload the balance.
The weight display shows "L" or "Err 54"	The weighing pan is not in place.	Position the pan.
The weight readout changes constantly	Too much vibration or the balance is exposed to a draft. The draft shield is not completely closed. A foreign object is caught between the pan and the balance housing. The below balance weighing port is open. The balance does not have a stable weight (absorbs moisture or evaporates). The sample is electrostatically charged.	Access the menu to select the correct code for the weighing. Close the draft shield. Remove the foreign object. Close the port for below-balance weighing.
The weight readout is obviously wrong.	The balance has not been calibrated. The balance has not been tared.	Calibrate the balance. tare before weighing.
"Err 30"	RS232 is blocked.	Confirm proper pinouts on cable. Check selected serial settings on balance and attached device.

Care and Maintenance

Servicing

Servicing of this balance can only be done by a manufacture certified service technician. See back cover for service information.

Cleaning

Before cleaning the balance, unplug the AC adapter from the wall outlet. Please do not use any aggressive cleaning agents (solvents or similar agents). Instead, use a piece of cloth which has been wet with a mild detergent (soap). Make sure that no liquid enters the balance housing. After cleaning, wipe down the balance with a soft, dry piece of cloth. Carefully remove any sample residue/spilled powder by using a brush or a hand-held vacuum cleaner. Make sure that no liquid or dust enters the crevice surrounding the pan adapter.

Safety Inspection

If there is any indication that safe operation of the balance with the AC adapter is no longer warranted, turn off the power and disconnect the equipment from AC power immediately. Lock the equipment in a secure place to ensure that it cannot be used for the time being. Safe operation of the balance with the AC adapter is no longer ensured when

- there is visible damage to the AC adapter
- the AC adapter no longer functions properly
- the AC adapter has been stored for a relatively long period under unfavorable conditions

In this case, notify Denver Instrument at 1-800-321-1135. Only service technicians who are authorized by Denver Instrument and who have access to the required maintenance manuals are allowed to perform maintenance and repair work on the equipment



The operator shall be responsible for any modifications to Denver Instrument equipment and for any connections of cables or equipment not supplied by this manufacturer and must check and, if necessary, correct these modifications and connections.

If you use electrical equipment in installations and under ambient conditions requiring higher safety standards, you must comply with the provisions as specified in the applicable regulations for installation in your country.

Accessories

GLP Printer	Cat. No. 301380.1
Printer paper (1 roll/pkg.)	Cat. No. 901044.1
Printer Ink Ribbon Cassette	Cat. No. 901045.1
RS232 Cable (9-pin for computer)	Cat. No. 102043.1
BalanceTalk XL Interface Software	Cat. No. 902227.1
Remote display	Cat. No. 301378.1
External rechargeable battery pack	Cat. No. 301379.1
Density Determination Kit	Cat. No. 301377.1
In-use cover (analytical and square pan models)	Cat. No.400208.1
In-use cover (round pan model)	Cat. No.400207.1

Warranty Instructions

1. Please return the prepaid, pre-addressed Purchase Registration Card to Denver Instrument promptly upon your purchase of the Denver Instrument product. The return of the card is not a condition precedent to warranty coverage.
2. If you have any questions about a Denver Instrument Summit Series Balance, please call toll-free, **1-800-321-1135** or FAX a description of the problem to (303) 423-4831 for technical assistance.
3. If it becomes necessary to return your Denver Instrument product for service, you must obtain a "**Return Authorization Number**" Please pack the product securely in its original approved packing carton or an other suitable container. Include your Return Authorization Number on the shipping label. Shipping charges must be fully prepaid.

Return to authorized distributor or :

Denver Instrument
6542 Fig St.
Arvada, CO 80005
1-800-321-1135

Changing Menu Codes

To select specific functions, you will need to set the respective menu codes.

The keys have special functions for setting menu codes:

CAL/CF = Increases a number by one with each press (the numbers change in cycles)

TARE = Confirms and stores a code setting; and exits the menu

PRINT = Moves to the next of the three numbers of a code (1st-2nd-3rd-1st, etc.)

1. Press ON/OFF to turn off the balance.

(Example: Code 8 5 4)

1

2. Press ON/OFF to turn the balance back on. While all segments are displayed, hold down TARE until screen has 1 on the left side of display .

8

3. Press CAL/CF to increase number on display to desired value (until "8" appears).

8 1

4. Press PRINT to move to the 2nd number of the code.

8 5

5. Press CAL/CF to increase number on display to desired value (until "5" appears).

8 5 1°

6. Press PRINT to move to the 3rd number (when you move to the third number, the previously set menu code will appear).

8 5 4

7. Press CAL/CF to increase number on display to desired value (until "4" appears).

8 5 4°

8. Press TARE key to confirm the code you have just set (this is indicated by the "°" after the code).

9. Press TARE key for more than 2 seconds to store the new menu code setting.

Exiting the Menu without Storing Code Changes

Changes to the code settings are not stored if you turn off the balance by pressing ON/OFF while selecting the code numbers or before pressing TARE to save a setting.

Undoing All Menu Code Changes – Reset Function

The reset function lets you undo all menu code changes, which means that you will obtain the original factory-set menu codes identified by an "°." To use this function, select code 9 – 1° using the above instructions.



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